DOCUMENT RESUME

ED 243 717 SE 044 491

AUTHOR	Train, Russell E.
TITLE	Corporate Use of Information regarding Natural Resources and Environmental Quality.
INSTITUTION	World Wildlife Fund, Washington, DC.
SPONS AGENCY	Council on Environmental Quality, Washington, D.C.
PUB DATE	May 84
NOTE	98p.
PUB TYPE	Reports - Evaluative/Feasibility (142)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Data; Decision Making; *Federal Government; *Industry; *Information Services; *Information Sources; *Information Utilization; *Natural Resources; Questionnaires
IDENTIFIERS	*Environmental Quality

ABSTRACT

This report presents findings and recommendations from a 1-year study which identified corporate needs for resource information (particularly statistical information) and assessed the extent to which these needs are being met by various resource-information services, including those of the federal government. Chapter I discusses 11 types of corporate decisions requiring use of resource information (such as resource acquisition, production capacity, plant siting, research and development, and bank lending). Chapter II discusses the sources corporations rely on for their resource information, describing these sources and rating their relative importance in providing information. Chapter III assesses the performance of public and private organizations which provide such information to U.S. corporations, discussing strengths of their performance and exploring opportunities for improvement in performance as identified during interviews with 229 information users at 45 of America's largest corporations, trade associations, and private information companies, and by a survey of 110 information users (survey questionnaire is provided in an appendix). Chapter IV presents six recommendations for improving the U.S. Government's resource-information systems, including establishing an international resource information clearinghouse and improving the credibility of government natural resource forecasts, and strengthening federal statistical policy management. Ninety-six percent of the 229 participants agreed with these recommendations. (JN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED243717

Corporate Use of Information Regarding Natural Resources and Environmental Quality

Prepared By Russell E. Train, President,
World Wildlife Fund
For The Council On Environmental Quality

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

Joel Horn

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

SE044491

WORLD WILDLIFE FUND-U.S.

GENERAL DISCLAIMER

We note at the outset that the male pronoun "he" is used consistently in this report only for the sake of simplicity and does not represent any discriminatory intent.

ACKNOWLEDGEMENTS

This report is a product of the combined efforts and contributions of a great many individuals and organizations. I wish to express my appreciation to all those who were instrumental in ensuring its success.

First and foremost, I wish to thank the 45 corporations, trade associations, and private information companies which participated in this study. I was truly impressed with the amount of time and effort which they expended, not only in basic research, but in providing conscientious, insightful, and thorough evaluations of the draft report.

Officials of the Federal government have been unstinting in their cooperation and support. In particular, I thank A. Alan Hill, Chairman of the Council on Environmental Quality, and members of his staff; especially Tom Magness, Kemp Harshman, and Susan Cohen. William D. Ruckelshaus, Administrator of the Environmental Protection Agency and members of his staff, especially Alvin Alm, Deputy Administrator, and Milton Russell, Assistant Administrator for Policy, Planning and Evaluation, were extremely helpful. Bruce K. Chapman, Deputy Assistant to the President for Planning and Evaluation, also provided valued advice and review.

Much of the credit for the study goes to the project advisors: Joseph Duncan, Chief Statistician of Dun & Bradstreet, William W. Wommack, former Vice Chairman of Mead Corporation, and Dr. Lynn Phillips, Professor of Marketing, Stanford Graduate School of Business. I am grateful to them for their continued advice and review. I also wish to thank Ruth Karen of Business International and Robert Rich of the Carnegie Mellon Institute for their assistance in the initial phases of this study.

The Stanford Graduate School of Business generously permitted me to use its computer facilities in analyzing the survey results. Two doctoral students at the business school, Gwen Ortmeyer and Cathy Anterasian, provided invaluable assistance with the survey as well.

The members of The Year 2000 Committee gave their encouragement, support, and thoughtful review to the report. Robert O. Anderson, Co-Chairman with me of the Committee, George P. Mitchell, and Elliot L. Richardson deserve special mention.

Finally, I extend my warm appreciation to the staff of The Year 2000 Committee for their efforts to see this project to its successful completion. Very special thanks to Joel Horn, Staff Director, his assistant, Paige Thompson, and to the research staff: Karen Heilman, Tod Heisler, Kelly Teevan and Jan Van der Voort. I am grateful also to Vanessa Floyd and Maryann Hrichak for their much needed administrative and typing skills and to Susan McGrath and Thomas Winston, our copy editors.

All of the people mentioned here have put an extraordinary amount of effort into this project. To them goes the major credit for the report. I firmly believe in the importance of its results.

May 16, 1984

Russell E. Train
President
World Wildlife Fund
1601 Connecticut Ave. N.W.
Washington, D.C. 20009

TABLE OF CONTENTS

		Page
	LIST OF EXHIBITS	i
	EXECUTIVE SUMMARY	ii
	INTRODUCTION	1
	1. Purpose of Study	
	2. Methodology	
	3. Definitions	
	4. Guide to Using This Report	
I.	DECISIONS REQUIRING THE USE OF RESOURCE INFORMATION	10
	1. Strategic Direction	
	2. Market Research	
	3. Resource Acquisition	
	4. Production Capacity	
	5. Plant Siting	
	6. Plant Design	
	7. Environmental Compliance	
	8. Production and Materials Purchasing	
	9. Research and Development	
	10. Bank Lending	
	11. Investment Recommendations	
II.	SOURCES CORPORATIONS RELY ON FOR RESOURCE INFORMATION	28
	A. Organizations Upon Which Corporations Rely for Resource Information	
	1. The Federal Government	
	2. Information Companies	
	3. Trade and Professional Associations	
	4. International Organizations, Foreign Governments, State & Local Governments	
	5. Other Corporations	
	B. The Relative Importance of Organizations Providing Resource Information	
III.	CORPORATE EVALUATION OF THE PERFORMANCE OF INFORMATION PROVIDERS: STRENGTHS AND OPPORTUNITIES FOR IMPROVEMENT	36
	A. The Characteristics That Determine the Usefulness of Information: A Framework for Analysis	
	B. Corporate Evaluation of the Performance of Resource Information Providers	
	1. User Awareness	
	a. Evaluation	
	b. Opportunities for Improvement	

2. Relevance
   a. Evaluation
   b. Opportunities for Improvement
      i. International Data
      ii. Environmental Quality Data
3. Reliability
   a. Evaluation
   b. Opportunities for Improvement
4. Usability
   a. Evaluation
   b. Opportunities for Improvement
5. Summary of Corporate Evaluation of Information Providers

IV. RECOMMENDATIONS AND DISCUSSION 58

Introduction

A. Improving the Usefulness of Government Resource Information
   1. The Creation of an Index of Government Resource Information
      a. Recommendation
      b. Discussion
   2. The Establishment of a Clearinghouse for International Natural Resource Information
      a. Recommendation
      b. Discussion
   3. The Collection of More and Better Data Regarding Environmental Quality
      a. Recommendation
      b. Discussion
   4. An Improvement in the Credibility of Government Natural Resource Forecasts
      a. Recommendation
      b. Discussion
   5. An Improvement in the Timeliness of Government Resource Information
      a. Recommendation
      b. Discussion

B. A Strengthening of Federal Statistical Policy Management
      a. Recommendation
      b. Discussion

C. Corporate Evaluation of Recommendations

APPENDICES 73

1. Electronic Access
2. Survey Questionnaire
3. List of Products Generated by the Study in Addition to this Report

LIST OF EXHIBITS

Exhibit 1 - Organizations Participating in This Study 5

Exhibit 2 - Resources/Information Definitions 8

Exhibit 3 - Geographic Information System 19

Exhibit 4 - A Framework for Analyzing the Performance of Information Providers 37

Exhibit 5 - Corporate Evaluation of Recommendations 70

EXECUTIVE SUMMARY

This report presents findings and recommendations from a one-year study of the corporate use of information regarding natural resources and environmental quality. Russell E. Train, President of World Wildlife Fund, undertook this research under contract to the Council on Environmental Quality in the Executive Office of the President of the United States.

Personal interviews were conducted with 229 information users at 45 of America's largest corporations, trade associations, and private information companies. In addition, 110 information users participated in a written survey.

Our principal findings are the following:

- U.S. corporations urgently need more international data.
- U.S. corporations feel that the government's natural resource forecasts are not credible.
- U.S. corporations need upgraded and expanded data on environmental quality.
- U.S. corporations believe that government information is not timely.
- Information on natural resources and environmental quality is vital to the success of U.S. corporations.
- U.S. corporations depend on a large body of this information in making decisions regarding capacity, siting, marketing, production, and strategic planning among others.
- The U.S. government is the principal source of information on natural resources and environmental quality.

To improve the network of information sources available to U.S. corporations and to promote better decision-making, we recommend the following:

- the establishment of a clearinghouse for international natural resource information;
- an improvement in the credibility of government natural resource forecasts;
- the collection of more and better data regarding environmental quality;
- an improvement in the timeliness of government information;
- the creation of an index of government natural resource and environmental quality information; and
- a strengthening of Federal statistical policy management.

Each of the 229 participants in the study were given an opportunity to evaluate the six recommendations of this report. Overall, 96% of the corporate responses agreed with the recommendations; 25% of these agreed with qualifications. Only 4% of the corporate responses disagreed with the recommendations.

INTRODUCTION

Purpose of Report

This report addresses the following question: Is the success of our corporate sector influenced by information on the changing quantity, quality, and cost of the earth's basic resources? To examine the complex issues surrounding this question, Russell E. Train, President of World Wildlife Fund, collaborated with the Council on Environmental Quality (CEQ) to study the uses by large U.S. corporations of information on natural resources and environmental quality (hereafter referred to collectively as "resource information").

The purposes of this report are (1) to identify corporate needs for resource information; (2) to assess the extent to which these needs are being met by various resource-information services, including those of the Federal government; and (3) to recommend improvements to the Federal government's resource-information services. The views reflected in this report are those of the corporate participants alone, and not those of members of CEQ, or of World Wildlife Fund.

The genesis of the study behind this report can be traced to CEQ's response to a growing public awareness that the U.S. economic system is increasingly sensitive to events beyond its borders. A rapidly changing world, with expanding populations, increasing international trade, and rising foreign competition in domestic markets, has created increased U.S. demands for information regarding economic and resource activities worldwide. One of the people

interviewed for this study, a purchasing specialist, described this changing situation with reference to agricultural commodities:

> Ten years ago the world was fairly simple. All we had to know was how much was produced and what the consumption was going to be. But in 1972 and '73, it became much more international. The wheat agreement with the Soviet Union alone changed the complexion of agricultural markets. Then we had the first oil embargo. Then a series of wage and price controls, and a lifting of those controls. We've gone through record inflation; a period of deflation; a couple of recessions; gold going to $800 an ounce and then back down to $400; the Hunt silver debacle; also the Iranian crisis. This is just all in the last decade. And then to cap it off, we are now faced with a world debt crisis. So the world of commodities and raw materials has become a lot more complicated. Those of us who got involved in business before about 1970 have had a very difficult time adapting to today's environment. We've had to go back and retrain ourselves... and try to analyze the relationships between, say, gold and soybeans, silver and soybeans, and debt problems in Argentina and soybeans. We've had to become no less analysts of supply/demand, but we've had to add new skills to our repertoire: to become political analysts, to become more astute weathermen.
>
> Regions of the globe are far more dependent today on one another than they were 50 years ago, 20 years ago, even 10 years ago. And because they are so much more interdependent, we have to understand the various aspects of this interdependency, and in so doing, we've got to have information.

Currently, the world is experiencing an information revolution with unprecedented advances in computer and telecommunications technologies. These technologies are continuously offering new ways to provide decision-makers with information about this rapidly changing, interdependent world.

Understanding both the expanding needs for resource information and the dramatic leaps in information technology, CEQ undertook several initiatives to evaluate the ability of the

Federal government to meet the rapidly changing needs for resource information in the government. As part of this effort, CEQ helped to establish the Interagency Global Issues Working Group in late 1981.

The Working Group has conducted several studies of ways to improve the resource information systems within the Executive Branch. Furthermore, realizing that the Federal government provides information to society as a whole, CEQ broadened its assessment of users' needs to include private sector users of resource information. And if recommendations to improve Federal systems were to be realistic, CEQ concluded that private sector needs should be factored into these recommendations.

Methodology

On May 17, 1983, CEQ contracted with World Wildlife Fund to carry out this study. The study investigates: (1) the relevance of resource information to corporate decision-making; (2) the kinds of information about resources the private sector seeks; (3) the role of the Federal government in meeting information needs, including the usefulness of the government's information services; (4) the roles and performance of private providers of resource information; and (5) the relative importance of the characteristics that determine user satisfaction with resource information.

The study plan developed to investigate these issues emphasized personal interviews at 30 of the largest corporations in America. These corporations make significant resource allocation decisions in the U.S. and abroad. As outlined in Exhibit 1, they represent a wide range of industries, including: agribusiness, commercial and investment banking, chemicals, resource extraction, manufacturing, forest products, petroleum refining, food retailing, and electric power generation. In addition to these 30 corporations, seven trade associations and eight private information companies participated in the study.

In total, 229 middle-to-top managers and analysts were interviewed. Among these participants were presidents, vice presidents, chief economists, directors of strategic planning, directors of marketing research, environmental managers, materials purchasers, engineers, and many others. These information users gave detailed answers to the following questions:

1. What kinds of decisions do you make which require resource information?
2. What is the importance of resource information in making these decisions?
3. Could you describe the content of the resource information you use?
4. What proportion of the resource information that you use comes from the Federal government? From private sources?
5. What is your opinion of the resource information you receive from the Federal government? From private sources?
6. How do you receive this information? In printed form? On computer tape? Electronically?

EXHIBIT 1

ORGANIZATIONS PARTICIPATING IN THIS STUDY

CORPORATIONS

AMAX
American Express
Armco
Atlantic Richfield
Bank of America
Boeing
Cargill
Conoco
Du Pont
Exxon
Fireman's Fund
Ford Motor Company
Frito-Lay
General Motors
Hewlett-Packard
Kroger
Mead
3M
Monsanto
Occidental Petroleum
PepsiCo
Phibro-Salomon
Reynolds Metals
Shearson/American Express
Southern California Edison
Standard Oil of California
Tenneco
Union Carbide
U.S. Steel
Weyerhaeuser

TRADE ASSOCIATIONS

American Iron & Steel Institute
American Paper Institute
American Petroleum Institute
Chemical Manufacturers Association
Edison Electric Institute
Information Industry Association
Motor Vehicle Manufacturers Association

PRIVATE INFORMATION COMPANIES

Chase Econometrics
Conrad Leslie
Data Resources, Inc.
DIALOG
I. P. Sharp Associates
McGraw-Hill, Inc.
Mead Data Central
National Planning Data Corporation

7. Have your needs for information changed significantly in the past five years?

8. Is there information which you need that is unavailable?

9. What do you feel is the proper role of the Federal government in providing resource information? What is the private sector's role?

10. Have government cutbacks affected the resource information upon which you rely?

11. In what ways can the government improve its resource information services?

In addition to the 229 personal interviews at 45 organizations, 110 individuals at 20 of the participating corporations were asked to respond to a written survey. The purposes of the survey were (1) to identify the types and sources of resource reports used by analysts, (2) to determine the users' opinions of these reports, and (3) to discover what characteristics (e.g., timeliness, clarity, accuracy) are most important in determining user satisfaction with these reports. Furthermore, the survey yielded insights as to how well information providers (e.g., government, trade associations, publishing companies) perform on these characteristics.

This report does not attempt to cover all the issues raised in the interviews and questionnaire. The project resulted in hundreds of taped interviews and a 500-page document detailing every interview. This material, along with the 110 written surveys and the computer printouts containing survey results, has been analyzed for the specific purposes of this report. The complete body of this detailed information has been submitted to CEQ under separate cover. (See Appendix 3).

Definitions

Throughout this report we use the terms "resource information" and "natural resource information". Understanding the different definitions of these terms is crucial to an understanding of this report. For purposes of this report, the term "resource information" refers to information regarding both natural resources and environmental quality. The term "natural resource information" represents a subcategory of "resource information", and includes such topics as minerals, forests, and food crops. For purposes of this report, "natural resource information" also includes information regarding human population, or demographic information. Environmental quality information includes such topics as air quality (e.g., urban pollution, acid rain), water quality (indicators for surface and subsurface waters), and land quality (e.g., erosion, desertification, hazardous wastes). It must be remembered, therefore, that the term "resource information" encompasses both natural resource information and environmental quality information.

The term "information" refers to quantitative measures, in particular statistical information. The information can be printed (reports, newspapers, newsletters), verbal (telephone conversations), electronic, cartographic, or photographic.

Exhibit 2 illustrates the relationship between resources and information as covered in this report.

EXHIBIT 2

RESOURCES/INFORMATION DEFINITIONS

RESOURCES	INFORMATION
A. Natural Resources	
Agricultural Commodities: Livestock, Food Crops, Forests	Supply/Demand/Price/Production/ Productivity/Trade
Climate	Temperature Ranges/Frost-Free and Sunshine Days/Wind Velocities/Prevailing and Seasonal Storms/Precipitation
Demographics/Human Population	Size/Growth/Fertility/Mortality/ Migration/Geographic Distribution/ Make-up (age, sex, race)/Density
Fuel/Nonfuel Minerals	Supply/Demand/Price/Production/ Reserves/Trade/Projections
Land Resources	Distribution/Land Use/Development/ Geology
Renewable Energy Resources	Quantity/Location/Usage/Price
Species	Classification (Endangered or Non-Endangered)/Population Distribution
Water Resources	Supply/Demand
B. Environmental Quality	
Atmosphere & Air Quality	Quality Indicators of Lower and Upper Atmosphere/Acid Rain/Urban Pollution/ CO_2
Water Quality	Quality Indicators for Surface and Subsurface Waters
Land Quality	Erosion/Desertification/Reclamation/ Solid, Hazardous, Chemical Wastes

Guide to Using This Report

The four main chapters of this report discuss the study's findings and recommendations.

Chapter I discusses 11 types of corporate decisions requiring the use of resource information. At least one example is described for each of the 11 decision types.

Chapter II discusses the sources corporations rely on for resource information. This chapter has two sections: the first describes the various information sources; the second rates the relative importance of these sources in providing information.

Chapter III discusses how corporations evaluate the performance of the various information providers. This chapter has two sections: the first outlines a framework for analyzing the corporate evaluation; the second uses the framework both to evaluate the information sources and to describe opportunities for improvement.

Chapter IV presents six recommendations for improving the U.S. government's resource-information systems. Each recommendation is followed by a discussion of the reasons for the recommendation.

I. DECISIONS REQUIRING THE USE OF RESOURCE INFORMATION

Resource information is vital to the continued success of America's corporations. Our study identified countless corporate decisions that require the use of information regarding natural resources and environmental quality. In this chapter some of these decisions are examined. While realizing that corporations use many different kinds of information in making decisions, we have focused on their use of resource information. These decisions range in magnitude from the relatively routine purchasing of materials to crucial long-term acquisitions. The amount of required information is also highly variable. In commodities trading for example, a single piece of natural resource data, such as a price, may inform hundreds of daily decisions; whereas a once-in-a-decade decision, such as investing in new production facilities, may require data from hundreds of individual natural resource and environmental quality reports.

The types of decisions encountered in this research have been categorized as follows:

1. Strategic Direction
2. Market Research
3. Resource Acquisition
4. Production Capacity
5. Plant Siting
6. Plant Design
7. Environmental Compliance
8. Production and Materials Purchasing
9. Research and Development
10. Bank Lending
11. Investment Recommendations

1. Strategic Direction

Decisions involving the strategic direction of a corporation are so important that they must be made by its senior management or board of directors. Such decisions set broad objectives and direction

for the corporation. Strategic direction decisions frequently require the use of resource information on a wide array of topics.

Several specific kinds of decisions can be categorized as strategic direction decisions. Examples would be an oil company's decision to move out of retail gasoline sales in order to focus on the extraction and refining segments of its business; a railroad company's decision to become a natural resource company by developing the resource potential of its land holdings; or a chemical company's decision to acquire an oil company.

One of the most detailed analyses of strategic corporate direction which we encountered is that undertaken by the Boeing company. Boeing reassesses its strategic direction every four to six years. A task force of eight Boeing senior staff was recently assembled to conduct an intensive analysis of Boeing's present lines of business, the external factors affecting its businesses, and business opportunities for the future. The product of their efforts was a series of recommendations to top management regarding the prospects for success in current lines of business, as well as possible new business start-ups or acquisitions. Much of the data used to derive these recommendations pertains to natural resources.

Boeing's task force began the process by examining trends in the four basic inputs to its businesses: raw materials, labor, technology, and financial capital. The analysts obtained detailed information in each of these areas. They analyzed all of the natural resource inputs to their manufactured goods and the possible substitutes for these

raw materials by examining reserves of the materials, competing demands, prices, and other factors. Also, they analyzed the cost and availability of the basic energy resources (e.g., coal, oil, natural gas, electricity) which power the manufacturing processes and fuel many of its products. They projected cost and availability to the year 2000 to determine if Boeing should expect any natural resource availability problems in the near or long term.

Next, the task force considered the composition and growth of the labor force and the users of the company's products. Demographic information is crucial to this analysis, as the age, sex, and race of the population must be projected in order to estimate how the composition of the labor force might change. What portion of the labor force will be Spanish speaking or female? What will be the proportion of skilled to unskilled labor? How will the aging of the population affect the work force and use of air travel? Furthermore, what effect will new technologies, such as automation, have on the labor force?

Finally, the task force studied the financial markets in an effort to estimate the availability of capital required for future Boeing investments. This requires an examination of many facets of the world economy including the ability of developing countries to repay foreign debts and the probable effects on American financial institutions if debtors default. In addition, the task force looked at foreign trade, the effect of trade barriers on their export-oriented businesses, and the prospect for new market opportunities abroad.

The final aspect of the planning process entailed an analysis of new technologies which might either influence Boeing's assumptions about the future of raw materials, labor, and capital, or represent business opportunities or threats to be explored.

2. Market Research

Market research contributes vital information to basic decisions made by corporations: which new products to develop, which existing products to emphasize in which markets, how to sell those products, in what kind of packaging and at what price. Although many types of resource information are used in market research, the most important type of information to marketing analysts is population data.

Pepsi's National Media Manager depends on demographic statistics to develop advertising strategies. He breaks down population by household, age, and sex to evaluate the potential for market development for all Pepsi products. The Media Manager uses this information to decide how to spend the media budget. He makes trade-offs between spending money in markets where Pepsi is already popular and spending proportionately more money in markets where Pepsi has growth potential.

Demographic age breakdowns can also be crucial to decisions affecting profitability and new product development. A market researcher at Frito-Lay noted that his business needs to grow at 4% per year, whereas the population is projected to grow at only 1% per year to the year 2000. Segmenting the population by age, however, he sees that the 25 to 54 year-old age group will grow 3 - 4% until

1995. Hence, Frito-Lay's products must be attractive to this particular age group until 1995, at which time new products will have to be tailored to a relatively older population.

3. Resource Acquisition

Resource acquisition commitments, such as purchasing mineral rights, are typically major investments involving long periods of time. Often they take one of two forms: (1) the purchase of lands believed or known to bear the sought-after resource; or (2) the purchase of rights to extract the raw material, usually a long-term lease agreement. Natural resource companies must decide whether to increase their resource base, when to do so, where, and at what price to make the investment. Resource supply, demand, and price movements must be projected and evaluated in light of the companies' potential investment.

Planners at Atlantic Richfield must make long-term forecasts for energy supply and demand to assess potential oil and gas lease areas. The process, from initial acquisition to exploration, development, and final production, requires a long lead time, sometimes up to 25 years. Thus, planners must assess the energy environment several years into the future in order to provide information on the expected economic returns of potential oil and gas leases. They use natural resource information to answer questions such as: How much natural gas does the U.S. have? How much can be extracted at what prices, and what kinds of structural change might occur in the natural gas industry? They evaluate

information pertaining to gas reserves worldwide, alternative sources of energy, effects of different production rates, and energy demand worldwide. This wide array of natural resource information plays a vital role in making good resource acquisition decisions.

4. Production Capacity

Capacity, plant siting, and plant design typically are interrelated decisions because each decision can influence the cost and regulatory considerations of the others. Decisions to expand or reduce production capacity are influenced by the market for the product and its cost of production. The cost of producing steel, for example, can be influenced by natural resource information such as the world availability of iron ore. Furthermore, the cost of production, current and projected, can be strongly influenced by information on the availability and cost of fuels powering the production process.

Tennessee Gas Transmission (a Tenneco company) has decided that imported natural gas from Canada will be an integral part of its future natural gas supplies. Tennessee Gas, in conjunction with other gas transmission companies, has proposed building a pipeline from Niagara Falls, New York, to Leidy, Pennsylvania. This pipeline would transport gas from the Canadian border to the mainline facilities of Tennessee Gas. Additionally, Tennessee Gas has proposed expanding its facilities in the northeastern United States in order to provide transportation service to Boundary Gas, Inc., a group of

New York and New England distributors that proposes to purchase Canadian natural gas. This expansion will include additional compressor horsepower and pipeline.

Many pieces of resource information were significant in making these supply and capacity decisions. Resource analysts believe that gas production from reserves in the lower 48 states will decline. Information on Canada's resource base indicates that Canada can provide long-term supply at reasonable cost. Thus, Canadian gas can replace declining domestic supplies. Market information, including demographic data, indicates that demand sufficient to justify Canadian imports will exist on the Company's system for the term of the proposed import. Environmental data were used by analysts to assess the impact of the proposed pipeline construction. Based on this market, natural resource, and environmental data, Tennessee Gas decided to purchase Canadian gas and invest in new pipeline facilities. Tennessee Gas is awaiting regulatory approval on these projects.

5. Plant Siting

Plant siting decisions must consider the environment surrounding the plant location in two ways: the environment must accommodate the functional needs of a plant (e.g., water availability for paper products mills); and plant facilities must be designed to minimize negative impacts on the surrounding environment, such as pollution of the air and water around a steel mill. Corporations depend on many different kinds of resource information in making plant siting decisions, including a great deal of environmental quality information.

At Southern California Edison (SCE), the Research and Development Department has developed a comprehensive, computerized information system. Called the SCE Geographic Information System (GIS), it is designed to increase SCE's effectiveness in choosing a potential site which meets complex licensing requirements. In addition to the usual engineering constraints in plant siting (i.e., ground stability, availability of water, etc.), utility officials must consider variables such as proximity to population centers, transgression into natural areas containing protected plant and animal species, and proximity to unique cultural or archaeological sites. GIS helps Southern California Edison identify all alternative siting areas having equivalent constraints and opportunities, and deal with changing political and regulatory attitudes without redoing the data. GIS allows updating of data on an ongoing basis. For the GIS to be successful, SCE depends on resource information, including: air and water quality, geology, endangered species, weather, and population.

The computer enables SCE to eliminate unacceptable sites and to identify potentially favorable sites before engineers and biologists go into the field. GIS accomplishes this task by mapping a broad geographic region and analyzing that data using many siting criteria divided into categories such as engineering, environment, health and safety, and cost. The resource inventory maps described in Exhibit 3 illustrate the use of natural resource and environmental quality data in siting a power plant and its supporting facilities (e.g., transmission lines, access roads, pipelines). By overlaying the analyzed resource maps and by considering all criteria simultaneously, SCE can select candidate siting areas and exclude low-quality sites in the initial stages of the plant-siting process.

The next stage in the process entails field work by engineers and biologists -- to choose a final site from the candidate siting areas. The scientists must verify the data used by SCE to insure that, for instance, the subsurface geology in the site selected by the computer is indeed suitable for construction or that no endangered plant or animal species are present.

SCE's sophisticated use of resource data saves the company both time and money. It reduces the time necessary to make an initial analysis of site locations, shows where the siting budget can be most successfully spent, increases the effectiveness of personnel, and provides SCE with a basis for resolving conflicts with various regulatory agencies.

EXHIBIT 3

GEOGRAPHIC INFORMATION SYSTEM

The Geographic Information System (GIS) used by Southern California Edison is an "information system that handles geographically or spatially referenced data that can be stored, manipulated, analyzed, and displayed using a computer". The system will create maps using relevant data selected by the user. Each map tells a user about features in the mapped area: what the features are, where they exist, whether or not similar features exist, and how large or small the features are. This example is from SCE's Eastern Mohave Resource Inventory.

INTEGRATED TERRAIN UNIT MAP

(boundaries for the following information)

- Slope
- Surface Configuration
- Surface Modifier
- Landform
- Geology
- Soil
- Land Use
- Vegetation

CENSUS TRACT MAP

- 1970 Census Tract
- 1970 Enumeration District
- 1980 Census Tract
- 1980 Enumeration District

SPECIAL PHYSICAL FEATURES MAP

(locations, names, and descriptive information)

- Faults
- Age of Movement
- Earthquake Epicenters (events $\geq$4 on the Richter Scale)
- Magnitude, Intensity, Date and Time of Largest Recorded Event)
- Mines

SPECIAL RESERVED AREA MAP

- Land Ownership (i.e., private vs public, plus federal, state, county, etc.)
- Reserve Area
- Mandatory Class I Areas Under 1977 Clean Air Act Amendment
- California Desert Conservation Areas
- Bureau of Land Management Proposed Plan
  - Wilderness Study Area
  - Areas of Critical Environmental Concern
  - Multiple Use Class
- Calif. Dept. of Fish & Game Area of Special Biological Importance

HYDROLOGY MAP

- Type of Water Source
- Stream Course Order
- Periodicity of Water Source
- Flood Prone Zone
- Watershed
- Hydrologic Subunit (valleys)

In addition to natural resource maps, the system creates infrastructure maps, detailing existing types of transportation, energy, and communication, and administrative unit maps including information such as state and county names and boundary lines. Other data variables are also included in the above example.

6. Plant Design

Resource information influences such varied aspects of plant design as power source, operating procedures, material selection, and physical dimensions and characteristics of a plant.

From architects in General Motors' Architecture, Engineering and Construction Unit, we learned that GM uses a wide variety of resource information in the process of designing a new plant. For example, when focusing on the issue of how to power the plant, they need information on available energy to fuel the powerhouse. Many different types of boilers are used in these powerhouses--gas, oil, coal--so they need information regarding the availability and cost of all of these natural resources. Furthermore, they need this information for many years in the future, since they expect a boiler to last 40 years or more.

In addition to energy information, GM's engineers need data on water. Since the plants use a great deal of water, these engineers closely monitor the quality and quantity of water in the surrounding area as an input in determining plant design.

The Architecture, Engineering and Construction Unit is also responsible for designing the sewer systems, smokestacks, and air-conditioning systems for new plants, and its staff require a wide range of atmospheric data. For example, they need to know how

much rainfall to expect in order to construct an appropriate sewer system. To design the smokestacks, they need to know wind velocities to determine height; and they choose which direction to place the buildings by evaluating the prevailing winds. And to determine the output capability of the air-conditioning system, they need to know the number of sunshine days, the temperatures, and humidity levels.

7. Environmental Compliance

Many of the corporate executives we interviewed are involved in activities which subject them to regulation under the Clean Air Act, the Clean Water Act, and the Resources Conservation and Recovery Act.

That corporations are subject to regulation in these areas necessitates their use of environmental quality information in two major ways: (1) for debating the standards set in regulations, and (2) for complying with them.

With respect to debating standards, many executives believe that when Congress sets standards to be included in environmental legislation, it rarely acts upon adequate data. Many seem to feel that standards are often set based more on an emotional reaction to a perceived problem than on rational deliberation based on fact. In an effort to remedy this situation, corporations often gather their own data and present it to Congress in hopes that it will be used to help formulate regulatory standards.

The importance of providing adequate environmental data was described by the Director of Environmental Health and Safety at Du Pont:

> The Federal government has recently been engaged in efforts to tighten up effluent limitations regarding toxic substances as set forth in the Clean Water Act. These efforts are based on the presumption that these substances are rampant in all waters. In an effort to rebut this presumption, Du Pont spent $50,000 to determine the presence of toxics in the Neches River, in Texas.
>
> The results of Du Pont's study showed that there was not a toxics problem in the river: of the 129 toxic substances identified by the EPA, Du Pont found 17 in the river, none in a concentration high enough to be dangerous. Levels downstream from the Du Pont plant were no higher than levels upstream, indicating that the plant was not contributing to any toxic problem. It is this kind of data that corporations need and use to debate appropriate standards.

In addition to debating standards, corporations use environmental quality information to help them comply with permit requirements. For example, an environmental director at GM reported that some discharge permits allow the Company to receive credit for contaminants present in the river water used in the manufacturing process and subsequently returned to the stream (net contaminant discharge). Hence, a corporation not only needs information regarding the quality of the water being returned into the stream, it also needs information regarding the original quality of the water in order to make the comparison required by the permit.

The same sort of information is called for by some sections of the Clean Air Act: requirements aimed at the prevention of significant deterioration prohibit an increase in ambient levels of criteria pollutants in excess of a certain percentage of the available increment

for growth (the difference between current ambient quality and ambient quality standards). To prove compliance with these standards, a corporation must obtain accurate data regarding the quality of the air both as it was before their plant went into operation, as well as afterwards.

8. Production and Materials Purchasing

Production and materials purchasing decisions may be short or long-term decisions. They may be based on day-to-day operations and/or market activity, or they may be based on up to 25-year market forecasts. Any of these decisions can have a significant impact on a company's profit.

At Weyerhaeuser, production decisions are extremely complicated, involving planting and harvest decisions which can be as much as 50 years apart. Weyerhaeuser projects the supply, demand, and price of pulpwood and saw timber to determine how much of each species of tree to plant.

Since population trends strongly influence housing markets, Weyerhaeuser scrutinizes demographic information in an effort to estimate the demand for saw timber. To assess the supply of timber in the marketplace, analysts gather forest inventory statistics from many sources. Weyerhaeuser monitors these vital supply and demand statistics on an ongoing basis throughout the production process -- planting, forest management, and harvest. This information provides input to decisions regarding how quickly to cut and what types of trees to harvest first.

In automobile manufacturing, resource information influences the kinds of raw materials used to produce cars and trucks. At Ford, resource information is depended on heavily by analysts to make raw material price and availability projections. These projections are then considered by Ford's engineers and designers when they are deciding on the raw materials to be used in future vehicles. For example, the material price and availability analysts are projecting that platinum group metals will continue to be high priced and mostly imported. Consequently, engineers and designers are trying to reduce the amount of platinum group metals that they use in automotive catalytic converters. The price and availability projections also influence procurement decisions. For example, Ford could stockpile platinum group metals if a disruption or shortage in its supply was forecasted. Only a detailed analysis of a broad range of mineral resources can give Ford the confidence to make these expensive decisions.

Some of the most important decisions in the production process pertain to materials purchasing. The price at which a material is purchased can have a major impact on a company's profit margin. To compete, a company producing packaged food, machine tools, or even live cattle needs to be as sophisticated as its competitors in deciding when, where, and what quantity of materials to buy.

A specialist at Frito-Lay described a materials purchasing decision in which weather data was critical to his analysis. Frito-Lay is a large buyer of cottonseed oil, which it uses to fry

its snack foods. A Frito-Lay buyer told us that West Texas, where much cotton is grown, had recently suffered hail, high winds, and torrential rains. Much of the cotton crop had not yet been harvested, and the bad weather was delaying harvesting further. The later the harvest and the worse the weather, the smaller the total crop would be. The buyer believed that, based on weather information available to him, combined with historical yield and demand data, cottonseed oil prices would jump. He responded by purchasing a sizable quantity of oil in the cash market for future delivery, choosing the current known price over the potential for a higher price in the future.

9. Research and Development

Research and development departments are where many problems are solved and new opportunities discovered. In these departments, resource information is applied to solve a specific research problem or is used as a guideline for research. Every major company is involved in research of some sort. The following are examples of the use of resource information in research and development decisions.

At GM a great deal of research is conducted to determine engine design, that is, whether engines should be fuel-injected or turbo-charged, whether they should run on gasoline, diesel fuel, or gasohol. In the Fuels and Lubricants Department, researchers assess whether a particular engine design warrants further attention in light of the outlook in the transportation fuels market, for instance whether research should be concentrated on diesel rather than gasoline engines.

For this kind of decision to be made, energy resource estimates are constructed for petroleum, natural gas, coal, oil shale, and biomass. Then projections are made for what fuels will be available in the future and at what costs. Thus, detailed information concerning recoverable reserves, inventories, production, and consumption must be procured and projected to various targeted years.

10. Bank Lending

Financial service companies make many decisions which require the use of resource information. For a bank to make wise lending decisions--whether a seasonal loan to a small farmer or project financing of a large mining operation--the banker must understand the risks his client faces.

The Bank of America regularly uses information about a wide array of commodities and about most of the countries in the world. The bank's Economics and Policy Research Department uses such information to support lending decisions at two distinct levels. First, senior management is supported with an early-warning system for major policy decisions. Such a decision might be to stress high-technology loans over loans to another industry or to limit exposure in a particular country. Analysts might use information on development of a particular resource or population information to assess the economic and political outlook for a foreign country.

The second type of decision is whether to make or renew a specific loan. For instance, economists in the department analyze the price outlook for commodities which will affect the cash flow and profitability of a loan applicant. This information is given to the credit officer, who then assesses the viability of the project and decides whether to advance the credit.

11. Investment Recommendations

Thousands of individual and institutional investors base stock-purchase decisions on advice provided by brokers. As part of their service to clients, securities and commodities brokerage houses have developed expertise in anticipating price moves in investment instruments. We found that brokerage houses, in performing their analyses and in making buy/sell/hold recommendations, rely on up-to-the-minute resource information. Their collective judgments, in turn, become the latest "scoop" about specific securities or commodities.

The forest-products analyst at Phibro-Salomon's subsidiary, Salomon Brothers, Inc., is an acknowledged expert on the tree-based industries and corporations. He has made it his business to acquire and analyze as much useful information in his field as possible. He must know about each corporation--its management, plans, balance sheets, and operations. More importantly, he must know whether prevailing economic and trade conditions portend increasing or decreasing profitability for the industry as a whole. To do so, he regularly looks at timely data, both domestic and worldwide, regarding the volume and price of pulpwood, plywood and lumber, paper production, and timber sales.

II. SOURCES CORPORATIONS RELY ON FOR RESOURCE INFORMATION

The sources that U.S. corporations rely on for natural resource information are varied. They include information companies, trade associations, and international organizations among others; however, we found that the U.S. government provides more resource information to the corporations participating in this study than any other source. In this chapter, we describe our methodology, describe the leading sources of information -- Federal, private, and other -- and present evidence substantiating our findings.

Our research was conducted along two lines. First, we personally interviewed 196 information users at 30 corporations, following a structured interview guide. That process afforded us a broad view not only of corporate resource information needs, but also of the sources relied upon. In addition, we conducted a written survey (see Appendix 2) of 110 corporate information users to obtain detailed, quantitative information about the reports which the participants use.

In the survey each respondent was requested to (1) provide the name and source of the 10 resource reports most important to his work, (2) rank by order of importance the five most important reports to his work, and (3) evaluate the performance of those top five reports by responding to questions about 17 distinct features of each report. Finally, the respondent was asked to indicate on a scale of one to 10 his satisfaction with each report.

We received 110 responses to the written survey. Some respondents listed fewer than 10 resource reports which they deemed "most important" to their work, yielding a list of 877 reports. The findings in this chapter on sources of resource information, therefore, are based both on personal interviews and on the 877 report listings returned as part of the survey. The findings in Chapter III on the corporate evaluation of reports are also based on the interviews and on evaluations of the "top five" reports provided by the survey respondents.

A. Organizations Upon Which Corporations Rely for Resource Information

As noted above, we found that the U.S. government is the leading provider of resource information to the corporate sector. Additional important sources are information companies, trade associations, international organizations, local governments, foreign governments, and other corporations. These organizations are described below.

1. The Federal Government

The U.S. government approaches the gathering and dissemination of resource information in a highly decentralized way. Executive Branch departments, such as the Departments of Agriculture, Commerce, Energy, and the Interior, are the primary organizations for gathering and analyzing resource data. Many other entities, such as the Central Intelligence Agency and the Environmental Protection Agency, also provide data. Data collected by one entity may be analyzed

and published by another entity, as for instance certain data collected by the State Department is published by the Department of Agriculture. And much information, whatever its origin, is actually printed and sold by the U.S. Government Printing Office.

The Federal government usually collects information for its own policy, research, or compliance purposes. It makes a portion of that information available to the public in order to inform public debate and private decision-making.

2. Information Companies

The most important of the non-Federal sources of resource information are the "information companies". We have separated these companies into two categories: consulting companies and publishing companies. Consulting companies tend to work personally with corporate clients on analysis; publishing companies generally transmit information to subscribers in either printed or electronic form, but do not work individually with their clients. Most information companies perform one or more of the following functions: locating information, disseminating it, performing both generic analysis of an industry situation and client-specific analysis of a particular company's position in an industry, forecasting, and data base management (maintaining the quality and consistency of data bases). The staffs of these companies are often experienced in their field and frequently have come from positions as corporate analysts or government information providers. Since the services provided by information companies must be supported in the marketplace by client demand, they are generally tailored quite specifically to meeting the needs of corporate users.

3. Trade and Professional Associations

Trade and professional associations, in providing information, must also meet the test of supply and demand. Such associations (which we will refer to as "trade associations", for brevity) have a narrower client base than do the information companies, in that each trade association serves its particular industry and its professionals and does not focus on the information needs of other groups (government or academia, for example). Indeed, statistical publications of trade associations are often available only to a dues-paying membership. Consequently, such publications are tuned to the topical and timing needs of the membership, with information defined and aggregated for ready application to corporate analysis. Trade associations perform significant information functions: (1) they gather information from members and disseminate data and analysis to members; (2) they preserve confidentiality in information exchange; (3) they effectuate information exchange among companies which might otherwise violate antitrust statutes; and (4) they develop and publish industry positions on information issues.

4. International Organizations, Foreign Governments, State and Local Governments

Several international organizations also provide information to the private sector, particularly information regarding foreign countries. These organizations include the World Bank, the International Monetary Fund, the United Nations, the Organization for Economic Cooperation and Development, the European Economic Community, the International Energy Agency, and the Organization of Petroleum Exporting Countries. The dissemination of resource infor-

mation is not a principal function of most of these organizations, and their information output is not tailored to the private sector; nevertheless, they play an important role in international information exchange.

In addition, corporate analysts often go to foreign governments for data. They do so either to get data directly from its source or because no other channel provides the information.

Corporate analysts sometimes obtain information from state and local governments. Often data about land, water, and wildlife resources and environmental quality is more detailed and/or more abundant at the local level.

5. Other Corporations

Useful information also comes in published form from industrial or service companies which are not information companies per se. Bank of America and Standard Oil Company of California, two participants in our study, were cited as sources of information to other companies via published forecasts. These corporations perform analysis for their own purposes and then release it in order to serve clients or the public at large.

With modest additions from other sources, the organizations described above constitute the current network on which U.S. corporations rely for resource information. It should be noted here that many corporations generate a good deal of data internally for their own purposes, to supplement the information from sources listed above. With the background provided in this section, we now explore the relative importance of the various sources.

B. The Relative Importance of the Organizations Providing Resource Information

The Federal government provides resource information to the private sector both directly and indirectly. A great deal of information which the corporations receive directly from other sources, such as private information companies, in fact originates in the Federal government.

With respect to direct receipt of information, the government is by far the most cited source. Through the written survey, corporate information users provided us with a list of the 10 (or fewer) statistical reports most important to their work, yielding 877 listings all together. Out of 110 respondents, fully 96 included reports from the Federal government in the list of their most important reports; the second most frequent source of information appeared in just 28 responses.

Of reports named in the final survey as the five most important to each respondent, fully 42% came to users directly from the Federal government. The distribution of the survey response listings was as follows:

FEDERAL GOVERNMENT 42%	PUBLISHING COMPANIES* 26%	TRADE ASSNS. 15%	CONS. COS. 10%	OTHER** SOURCES 7%

* The largest single publishing organization provided 6% of the report listings.

** International organizations, certain corporations, local governments, and foreign governments.

As for indirect use of Federal information, it is difficult to assess accurately the percentage of government information routed through other sources. It is safe to say that many non-government providers of resource information obtain much of their data directly from the Federal government but exactly how much is hard to determine.

We interviewed representatives of several prominent private sector information providers in an attempt to determine their reliance on Federal government information. National Planning Data Corporation, for example, uses Bureau of the Census data exclusively. At Chase Econometrics, reliance on government statistics averages close to 80% for all of its data bases but varies widely from one base to another. For example, Chase's agricultural data base is comprised exclusively of data from the Department of Agriculture (USDA), but only about 65% of its domestic energy data base comes from the government.

Resource information providers which do not rely on Federal government information at all are rare. Conrad Leslie, an agricultural consultant, is one exception. Leslie does not rely on the USDA for even basic U.S. crop production statistics. While the USDA surveys the farmer (producer) to determine grain production, Leslie believes that surveying the grain elevator operator (buyer) renders a more accurate picture of grain yields and their changes.

In assessing the degree of corporate reliance on the Federal government for resource information, the primary difficulty is that, in many cases, corporations do not know the original source of the information they receive. Frequently, data flows through two or three organizations before it reaches the corporation. For example, I. P. Sharp, an electronic disseminator of information, obtains its oil import data from the American Petroleum Institute which, in turn, gets it from the Department of Energy. Furthermore, corporations tend to believe that an organization which has built its reputation on providing a particular type of information is also the source of this information. The American Iron and Steel Institute (AISI), for instance, is considered by industry to be the primary source for information regarding steel imports. In fact, AISI obtains this data from the Department of Commerce and acknowledges that fact in news releases.

The above examples of direct and indirect provision of government data effectively illustrate our finding that the Federal government is the major source of resource information to the private sector.

III. CORPORATE EVALUATION OF THE PERFORMANCE OF INFORMATION PROVIDERS: STRENGTHS AND OPPORTUNITIES FOR IMPROVEMENT

In this chapter, we will assess the performance of the organizations, both public and private, which provide resource information to U.S. corporations. We will discuss the strengths of their performance and explore opportunities for improvement in that performance as identified by corporate information users.

A. The Characteristics That Determine the Usefulness of Information: A Framework for Analysis

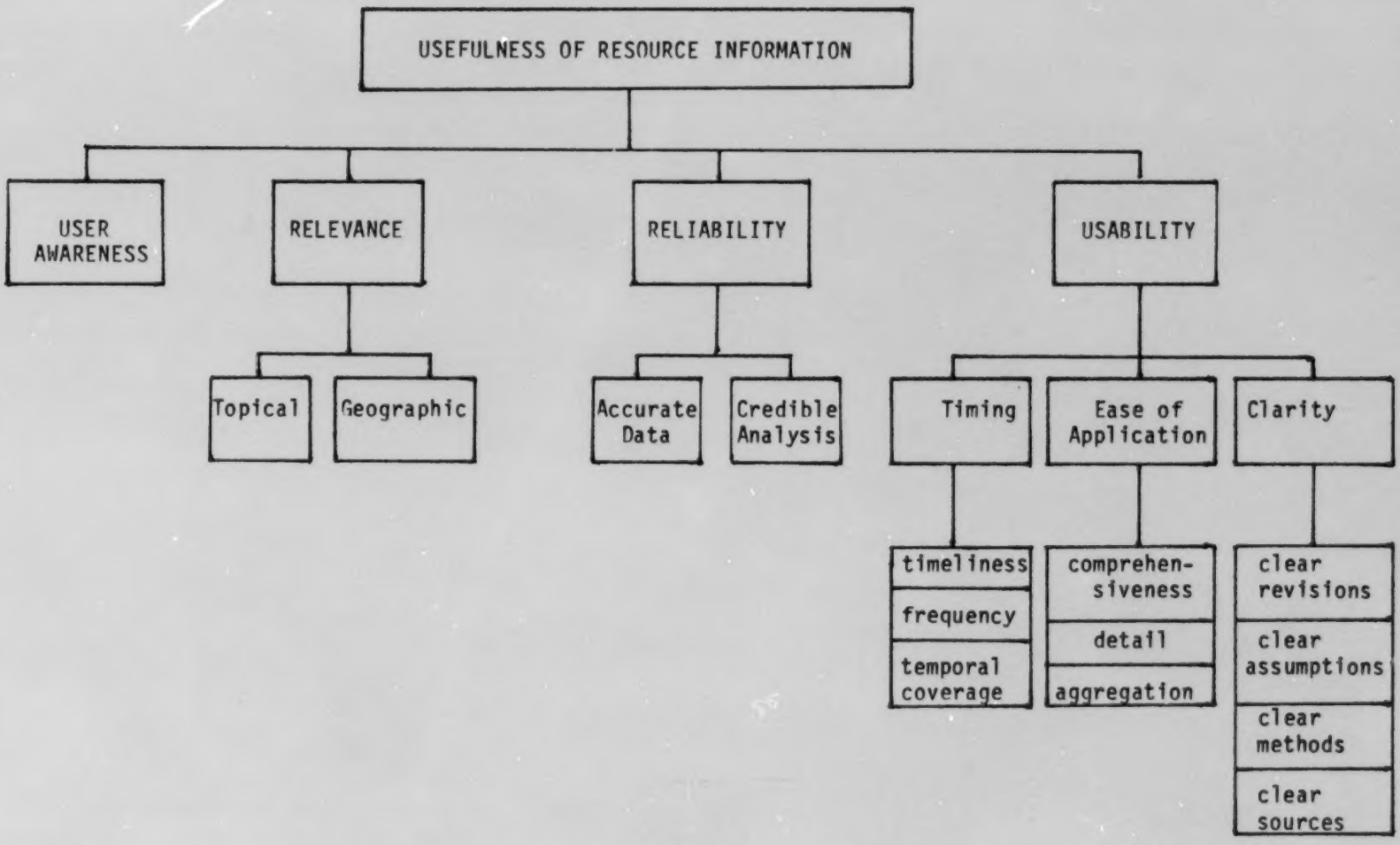
Throughout the course of our interviews, and through the written survey, we have identified certain characteristics as being most important to the usefulness of information. These characteristics, described in detail below, have been arranged into a "hierarchy of requirements" that provides a framework for analyzing the performance of various information sources in providing useful information. (See Exhibit 4, p. 37)

The four characteristics which we found to be of the greatest importance in making information useful are: (1) user awareness, (2) relevance, (3) reliability, and (4) usability.

User awareness simply means that before an analyst can use information (and determine whether information is useful or not), he must be aware of its existence and be able to locate it.

EXHIBIT 4

A FRAMEWORK FOR ANALYZING THE PERFORMANCE OF INFORMATION PROVIDERS



Once an analyst has located particular information, it must pass two tests of relevance: (1) topical relevance (the data must relate to the subject matter with which the analyst is dealing), and (2) geographic relevance (the data must cover the appropriate geographic area).

These characteristics represent, in essence, threshold requirements which must be met before information can be considered useful or not. If a user cannot locate information, it cannot possibly be of use to him. The same is true of information, once located, which does not relate to his topic of interest, or is not relevant.

The third characteristic important to useful information is reliability. As indicated in Exhibit 4, reliability has different meanings for the two categories of information covered by this study -- data and analysis. Reliable data, simply put, is accurate data. Reliable analysis is credible analysis. Credible analysis requires the application of human expertise to accurate data. This expertise can be in many areas, e.g., an understanding of markets, technology, politics, etc.

Usability is the fourth characteristic that is important to producing useful information. There are a number of characteristics which contribute to usability (see Exhibit 4) and which have contributing characteristics of their own. The three characteristics which contribute the most to usability are: (1) timing, (2) ease of application, and (3) clarity.

Timing can be broken down into three elements: (1) timeliness (having the information when one needs it), (2) frequency (how often new information is made available to the user), and (3) temporal coverage (what periods of time were covered by the information, e.g., years, months, or weeks).

Ease of application, the second characteristic contributing to usability, also consists of three elements: (1) comprehensive treatment of the subject matter, (2) sufficient detail, and (3) data aggregation at a suitable level. This last characteristic means that application of the data is facilitated when the user does not have to decompose grouped data into smaller units, nor aggregate numbers that are presented in an overly detailed fashion.

The third characteristic contributing to usability of information is clarity, which can be defined by its four attributes: (1) clear definition of methods used in assembling data, (2) clear outline of assumptions used in any analysis of data, (3) clear documentation of the sources of data, and (4) clear explanation of any revisions that are made. Clarity allows the user to quickly interpret and manipulate data and to apply it in any given situation.

The importance of these characteristics can perhaps best be understood by demonstrating their role in a typical example of information use. The example below, abstracted from our interviews, involves an analyst who seeks information about coal consumption in West Germany, for each year of a five-year period.

Before our analyst can decide whether to use information, he must first be aware of its existence. He may already know where to obtain the desired information, or he may need to search for it. He can contact people in the government or at other corporations; he may check the resources of the corporate library, or conduct an electronic search of data bases accessed through a terminal on his desk.

Once the analyst has located information that he might use, the information must pass the two tests of relevance: topical and geographic. In our example, the report must present information about the natural resource topic of interest, in this case, coal. More specifically, the report must present consumption of coal -- other topics such as discoveries, production, and net trade are not what the user seeks. To be geographically relevant, the report must deal specifically with West Germany; all of Europe lumped together does not serve the user's purpose.

Once the analyst locates the information and determines it is relevant, he wants it to be reliable. If it is raw data, the data should be accurate; if the information is in the form of analysis or a forecast, it must be credible.

If the analyst discovers reports that are relevant and reliable, he must evaluate the usability of each. One source might be eliminated because it cannot reach him soon enough, i.e., it is not timely. One might be eliminated because it requires him to take annual numbers from five volumes instead of presenting the five-year figure in one place, i.e., the data is not aggregated at an appropriate level -- it is too specific. Finally, one source might fail to make clear its methodology, thereby making the data unclear.

The framework explained and illustrated above will be used below as a basis upon which to evaluate the performance of information providers.

B. Corporate Evaluation of the Performance of Resource Information Providers

1. User Awareness

a. Evaluation

We have found that, while many corporate information users are able to locate the information they need, there is much room for improvement in the process by which this information location takes place. As noted by the Director of Technical Environment Evaluation at Ford: "In my view, the biggest void in this whole information area is 'what the sources are'. There needs to be a much better understanding of the sources of information available to the private sector."

The often-cited culprit in the area of user awareness is the Federal government. While major government publications are usually familiar to users, there are other reports with which users are not familiar, e.g., some of the reports generated by one-time studies. In many cases, information users must search through the indexes of several agencies to locate a report on a specific topic; alternatively, they might telephone government employees to ask for assistance in locating information.

The Manager of Information Services at 3M observed that "the primary problem with locating government sources is that there is no single reliable, comprehensive index of all government publications; it is necessary to check every available index if one really wants to find out if something exists on his topic." Corporate researchers say that they often give up a search because it consumes too much time, sometimes after wasting hours searching for non-existent information. This failure on the part of the

Federal government to clearly organize and index its information has serious deleterious effects. Federal statistical resources are wasted since users cannot take full advantage of them. More importantly, the efficiency of information use is decreased. This latter effect is compounded by both duplication of effort, i.e., corporate generation of data that already exists but could not be located, and by the effects of bad decisions which invariably result from a lack of information.

Private sector information companies and trade associations appear to do a better job of making the user aware of the information they provide. This finding is not surprising, however, since the very existence of such companies depends upon the patronage of the corporate sector. For indexed information, many of these companies also provide electronic search capabilities, a tool which has been identified as particularly useful to information users.

b. Opportunities for Improvement

Many corporations have an interest in and a need for using more government information. Unfortunately, the mechanisms for locating that information are proving inadequate to meet corporate needs. These mechanisms must be improved; in particular, there is a need for better indexes of government reports to provide greater accessibility to Federal government information.

2. Relevance

a. Evaluation

Our findings indicate that the Federal government is doing a good job of providing useful information about a wide array of natural resources. The government has well-maintained data bases which corporations use to inform their decisions. With regard to time series data, the government does a particularly good job with domestic resource supply, e.g., reserves, aggregate production, and net imports. The government does not, however, report as much information about market demand for natural resources as some corporate personnel, especially market analysts, would like.

Trade associations excel at meeting corporate needs for information on the processes of turning a natural resource into an economic resource. Information companies also contribute to the pool of this "process" information. In oil exploration and production, for example, these organizations provide useful information about drilling costs, riqs in use, wells drilled, producing wells, production and stocks by product, refinery runs, and capacity utilization. These organizations fulfill corporate needs for current market information as an input to short-term operating decisions.

Against a background of near sufficiency, however, and as a result of changes during the past two decades, the pool of resource information available to large corporations has failed to maintain its relevance in two important areas. First, corporations cannot

obtain enough international natural resource information; second, they cannot obtain adequate domestic or international environmental quality data. Private organizations have not been able to respond to these corporate needs, in part because of the enormous capital expenditure required to establish a data-gathering network for these topics. Another factor is the absence of any clear statement of Federal policy as to the extent of government involvement in providing such data.

b. Opportunities for Improvement

i. International Data

The need for international natural resource information prevails as the broadest and most significant unmet corporate data need. Whether a company operates internationally, purchases raw materials from another country, or simply buys and sells commodities priced in an international market, the company needs information which transcends U.S. borders. The following comments from our interviews illustrate this.

A senior economist at Standard Oil of California, which operates around the globe, describes the need for international data this way:

> We can't isolate any part of the world anymore. Everything is global... We put each country's data together and then produce an overall summary of supply and demand of petroleum in particular and energy in general. This serves as a backdrop for all decisions made in the company with respect to capital investment and operations.

ARCO Oil and Gas Company and ARCO Exploration Company, subsidiaries of the Atlantic Richfield Company, are responsible for exploration and production of oil and gas on the North Atlantic continent only. An ARCO planner explained that 20 or 30 years ago international data mattered little to the company because of its regional focus. Two changes in ARCO's operating environment have stimulated a need for international data. First, 20 years ago U.S. companies were subject to oil import quotas which somewhat insulated the domestic from the worldwide market, and U.S. government controls remained pervasive during the 1970's; but since 1981, deregulation has made the market much more competitive. Second, as oil prices, stable at $3.00 per barrel 25 years ago, jumped tenfold in the 1970's, the industrialized economies, dependent upon oil, have become more volatile. The increased unpredictability and pace of change have heightened the need for timely, accurate data about petroleum production, trade, and use -- in short, about the global energy situation including costs, prices, and values.

Resource companies are not alone in their needs for international resource information. The Bank of America holds a large international loan portfolio, extends credit to U.S. companies operating or trading abroad, and makes loans to domestic concerns which produce or use commodities, such as silver, that are priced in the global marketplace. For those reasons, economists at Bank of America need more foreign data than they can find. A vice president concerned with commodity and industrial analysis expressed this need as follows:

> As we become increasingly international and subject to influences from afar, it's more important to know about the international setting than it was... a number of years ago. We're increasingly dependent on that for both imports and exports. The importance of knowing those international statistics is increasing at a time when budget stringency means that information is not available.

Referring to a speech he had recently heard, the bank officer continued:

> President Reagan made the point that ninety percent of all U.S. manufacturing concerns do not export at all, and those companies must be producing some product that they could get into export markets... With the U.S. population growing relatively slowly, growth for U.S. companies may lie in foreign markets. Consequently, this need for foreign information will grow.

Representatives of many other corporations expressed strong opinions on the subject. The following is a brief sampling:

- At Ford, strategists perceived an acute deficiency in resources trade data. Compared to relatively plentiful supply data (reserves, production, capacity) very little country-by-country data regarding resource imports, exports, and consumption can be found.

- At Shearson/American Express, a commodities specialist spoke for his colleagues in commodities trading: "The hardest thing to get is international information. I can get anything on the United States. You name it, I can find it. When it comes to foreign countries, it's really hard to find some of their figures.

- A resource economist at Weyerhaeuser asserted, "There is a lack of international perspective to the research the government has done in the whole area of forestry and forest products. There is just not enough international perception of how nations interact on a global basis. We need a continuing research effort to gather global data and make it available in a form that's useful for decision-making.

To state that international data is scarce barely scratches the surface of the problem that U.S. corporations face. In some cases, foreign countries cannot make data available because they do not collect any; in other cases they do not make the data that is collected available because it is so inaccurate as to be unreliable.

The data in some countries may be inconsistent internally or aggregated so as to render it incomparable with data from other nations. An executive at Boeing, a large U.S. exporter, acknowledged the difficulty of competing globally on the basis of current information:

> International data availability is infinitely worse than U.S. data; one problem, of course, is that other countries don't keep good data -- though OECD countries are better than others. We are a worldwide competitive company and need worldwide data. We project that world trade will represent twenty-five percent of the world's gross domestic product by 2000. This country is just beginning to realize that we have spent a lot of time looking inward, and now we have to look outward. We need much better data from the rest of the world to do so with confidence.

These comments strongly support the finding that the resource information need with the greatest significance for individual corporations and for the vigor of the entire U.S. economy is the need for more international data.

ii. Environmental Quality Data

Another significant opportunity for improvement by the Federal government is with respect to environmental quality data, both domestic and worldwide. Many participants stressed the need for more credible and easily accessible information on environmental quality.

As noted already in another context, over the past 20 years many corporations have become subject to environmental regulations that affect their day-to-day business activities. The corporations need environmental quality information both to debate the reasonableness of standards in proposed regulations and to help them comply with whatever regulations are promulgated.

Many corporate participants complained about the government's environmental quality data. With respect to the establishment of appropriate standards, it is said that the government simply does not collect the data necessary to support the standards it establishes in regulations. Moreover, even when corporations conduct their own scientific studies in an effort to fill this data gap, executives feel that the studies are often ignored due to a widespread perception that corporate information is biased and therefore unreliable.

Whether or not this perception is justified, the situation is said to result in statutes being enacted more on emotions than on accurate data.

One example cited is the controversy over the destruction of the earth's protective ozone layer by man-made chemicals, such as chlorofluorocarbons (CFC's). In the mid-1970's, the Environmental Protection Agency accepted the theory that CFC's would reduce the earth's ozone by as much as 19% by the year 2100. Based on this theory, regulations were issued banning the use of CFC's in such products as deodorants and hairsprays in which they had previously been used.

Recently, the National Academy of Sciences released a report showing that CFC's might reduce the stratosphere's ozone by only 2-4% by the year 2100. Clearly, a great deal of uncertainty still exists with respect to the possible effect of CFC's on the earth's ozone and the corresponding health hazards.

Corporations do not expect perfection from regulators and are not arguing that the government should stop regulating in this area. However, particularly in light of the far-reaching economic effects of regulations, such as the ban on CFC's in aerosol sprays, this example supports the case of those who say there is a "rush to regulate" on the part of government agencies, and who demand that regulatory standards not be established based upon inadequate data.

The other use of environmental quality data is to assist in compliance with regulations. Many of these regulations establish allowable pollution standards that are based on a percentage allowance over a baseline level. For example, in the Clean Air Act, one of the standards set for allowable particulate at a certain site is 1% greater than a baseline level of particulate.

Many corporate interviewees complained that these baseline figures are not provided by the government. The lack of a baseline figure obviously renders compliance with regulations more difficult: without knowledge of a baseline, how can a corporation know when it has increased pollution to 1% above that level?

Baseline data regarding air and water quality is gathered by monitoring stations that are set up to collect information regarding levels of toxicity or particulate matter. In many instances, the government simply is not doing the monitoring necessary to provide this baseline data.

To facilitate their compliance with government regulation, most corporations expressed a need for an increased role by the government in this monitoring process. Such monitoring need not be done by the government on a site-specific basis, since that would be prohibitively expensive. However, corporate executives do feel that the government could be collecting and reporting data regarding long-term environmental quality trends for air and water on a city-by-city basis.

In addition, in some cases where the government has monitored, some corporate participants feel that the monitoring has been inaccurate. For example, one government monitoring station, set up to determine air quality for a particular region, was located in the parking lot of a bank where exhaust levels were so high as to be unrepresentative of the area as a whole. This example was presented as an extreme case of bad monitoring. It does provide, however, a vivid illustration of one gap in credible environmental quality data currently facing corporate decision-makers.

In sum, corporations need more and better environmental quality data. This lack of environmental quality data stems, in large part, from inadequate monitoring. Corporations see the monitoring problem as twofold: (1) not enough monitoring is done by regulating entities to enable reasonable regulation; and (2) when monitoring is done by a regulating entity, it is done at times in an arbitrary manner, producing unrepresentative and inaccurate baseline data.

3. Reliability

a. Evaluation

Except for environmental quality data, large U.S. corporations can obtain information which is reliable enough to perform analysis with confidence. Corporations, to a large extent, assume that the data they receive is accurate enough for purposes of analysis.

Concerning the quality of uninterpreted data, the corporate participants feel that the most accurate source of natural resource data is the trade association. The Federal government and publishing companies are viewed as providing somewhat less accurate data, with consulting companies trailing the other three groups. The performance of all sources on accuracy is judged high, reflecting the basic requirement that data be accurate to be useful.

Our research shows that trade associations and information companies perform reliable data analysis and interpretation. The Federal government's analysis, however, is judged as being far less credible than analysis from private sources. Many corporate analysts deem it to be useless if not detrimental. Specifically, they charge that government analysts either do not have or do not apply the expertise required to develop credible natural resource forecasts. A common complaint is that government analysts simply project historical trends (which might be highly accurate) out into the future, rather than basing forecasts on probable economic cycles, technological developments, materials substitution, energy-source substitution, and other effects of the forces of supply and demand.

b. Opportunities for Improvement

Regardless of the fact that many analysts at large corporations do not rely on government forecasts, they still worry about the quality of the forecasts for the following reasons. First, they think that widely conflicting public and private views on natural resource trends contribute to uncertainty in the business environment, hampering decision-making, and producing inefficiency in the marketplace. Second, they show concern for the plight of smaller companies, with fewer financial resources, which are forced to rely on flawed government forecasts and pay the price of poorly founded decisions. Third, they are concerned that the poor quality of government forecasts has a negative influence on government policy, which in turn affects the operating environment of all corporations.

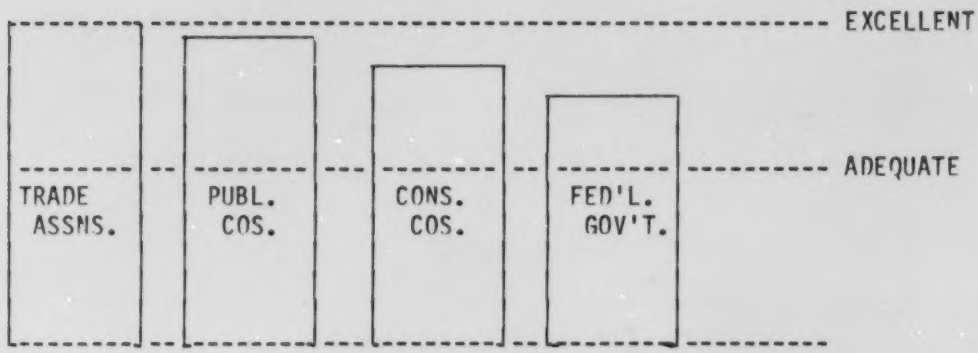
For all of these reasons, corporate representatives see a need for improved government natural resource forecasts.

4. Usability

a. Evaluation

Trade associations appear to be doing the best job overall of providing corporations with readily usable information. Usability, as shown in Exhibit 4, has three major contributing characteristics: timing, ease of application, and clarity. The bar graphs below illustrate corporate evaluation of providers' performance according to these factors, based on survey responses.

TIMING: Corporate Evaluation of Providers' Performance

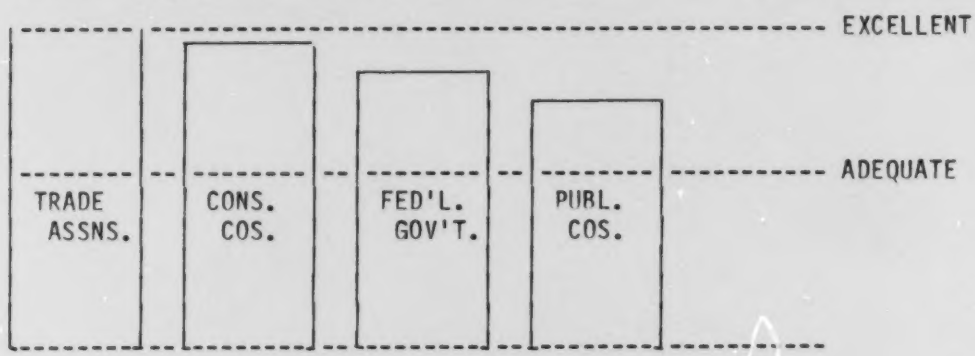


Timing is extremely important to most users. As the above bar graph summarizing the survey results shows, trade associations and publishing companies perform extremely well on the timing criteria. Consulting companies, providers more of expertise than of routine data, perform fairly well. The Federal government, as we were told consistently, performs noticeably worse than other sources. The bar graph is actually overly favorable in its representation of the government's performance because the survey covered only the five most important reports to each user. The top five are apt to be timely. Many government reports are so inadequate at timing

that they are not used and certainly would not be included in a user's most important reports. We illustrate below.

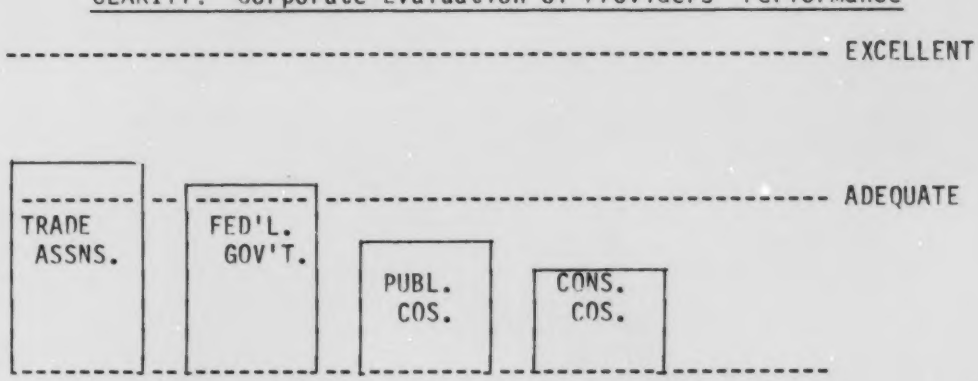
One analyst provided the example of annual petroleum reserve numbers, a critical statistic for exploration, development, and production decisions for large energy producers. Traditionally, the American Petroleum Institute unveiled the reserve numbers in the spring. A few years ago, the Federal government took over the data gathering and dissemination role for the reserve numbers and now they do not appear until October. Because of the additional six-month delay each year, analysts must use numbers from alternate private sources in the interim.

EASE OF APPLICATION: Corporate Evaluation of Providers' Performance



While corporate analysts reported a range of performance by information providers on ease of application (see bar graph), we encountered neither glowing praise nor a clamor for improvement. Trade associations and consulting companies tailor their work to corporate needs. The Federal government performs relatively well. Corporate analysts rate the performance of publishing companies lower, primarily because their coverage is not comprehensive.

CLARITY: Corporate Evaluation of Providers' Performance



According to our survey (see bar graph), no category of provider performs particularly well on clarity. Trade associations and the Federal government provide barely adequate documentation and explanation. The performance of information companies is deemed inadequate. Traditionally, clarity, while helpful, has not been critical to the usefulness of information. It appears, however, that the clarity with which providers document their information will be increasingly meaningful to users.

b. Opportunities for Improvement

Corporations need more timely information from the Federal government. This need pertains particularly to data. Because the government's data base covers so many topics, corporate analysts rely on it despite the lag-time between data collection and receipt by users. And, while the Federal government performs relatively well at documenting its information, the increasing sophistication of users requires that published information be explained more clearly.

5. Summary of Corporate Evaluation of Information Providers

In this chapter we have argued that corporate information users are generally pleased with the information available to them. Operating conditions are changing, however, and corporate information needs are evolving faster than our decentralized information network can respond. The most pressing corporate needs at present are for the following: a better way to find out about the existence of Federal government information; more international data and improved environmental quality data; more credible natural resource forecasting by the Federal government; and drastically quicker release of Federal government data.

IV. RECOMMENDATIONS AND DISCUSSION

Introduction

The usefulness of government resource information clearly can be improved. We strongly recommend the following:

(1) the creation of an index of government resource information;

(2) the establishment of a clearinghouse for international natural resource information;

(3) the collection of more and better data regarding environmental quality;

(4) an improvement in the credibility of government natural resource forecasts;

(5) an improvement in the timeliness of government resource information;

(6) a strengthening of Federal statistical policy management.

These recommendations come straight from the corporations; they reflect the information needs identified as most pressing by corporate interviewees.

The Federal government should promote the accomplishment of all six recommendations. This does not mean, however, that the government must perform all these steps itself. Careful consideration should be given to the appropriate role of the private sector in the implementation of these recommendations; in instances where private sector involvement would be advantageous, it should be permitted and encouraged.

In the following sections, we set forth the recommendations in detail and discuss the most important issues which arose in our consideration of these recommendations.

A. Improving the Usefulness of Government Resource Information

1. The Creation of an Index of Government Resource Information

a. Recommendation

The Federal government or a private sector organization should create an index of all unclassified and non-proprietery Federal government resource information.

- Following the completion of a study or report, government agencies should be required to send references to the indexing organization within a designated period of time.
- Each reference should be indexed by subject area as well as by publishing agency or department.
- Each reference should include an abstract and description of the data covered.
- The index should be updated on a regular basis.
- The index should be made available to the public.

b. Discussion

One of the complaints heard most often from corporate information users is the difficulty of locating government data they need; it is very frustrating, they say, to know that information exists and not know where to find it. Creating a comprehensive index to government resource information could contribute to the solution of this problem.

This recommendation raises three basic questions: Who should be responsible for this task? What information should be included in the index? How often should the index be updated?

Who should be responsible? While it might appear that the Federal government, with its authority to establish mandatory reporting requirements, is the appropriate organization to create and maintain a comprehensive index, it is not necessarily so. A private sector organization would be equally capable of putting together a comprehensive index if it obtained cooperation from the Federal government.

With respect to what should be included in the index, it was strongly suggested by respondents that the report title, data elements, and an abstract or brief summary of the report be included in each reference. The need for both a summary and description of the data covered arises from the fact that, often, a report title does not adequately indicate how relevant the report is for the user's purposes. The additional information would enable the index user to avoid ordering reports that would not be useful, thus increasing the user's efficiency level, and would improve the usefulness of the information system as a whole.

Corporate information users felt that the most useful way to categorize reports is by subject matter and by publishing agency or department. This approach to categorization would minimize the need for an information user to look in numerous indexes to find reports on the same subject.

Finally, to be useful, an index must be up-to-date. We recommend mandatory reporting requirements. The publishing agencies should report to the indexing organization within a time frame that will make the index most useful. In turn, the indexing organization should regularly update the index.

2. The Establishment of a Clearinghouse for International Natural Resource Information

a. Recommendation

The Federal government or a private sector organization should establish a clearinghouse for international natural resource information.

- The clearinghouse should gather already collected information on natural resources in foreign countries.
- The sources for the information should be the U.S. Federal government, the private sector where feasible, foreign governments, and international organizations.
- If the Federal government were to undertake this task, the responsibility should be placed in an agency which is already set up to collect, index, and disseminate information; the agency should have extensive experience in U.S. and foreign statistics, such as the Bureau of the Census.
- The data should be standardized whenever possible so that it is comparable from one country to another.
- The information should be indexed.
- The information should be available to the public.

b. Discussion

The lack of adequate international data on natural resources is a clear gap in the U.S. information base. A clearinghouse for this data would meet one of the most pressing needs of corporate information users.

In considering this recommendation, we were influenced by the following coincidence: not only is there a pressing need for more international data, there is also a great deal of natural resource information on foreign countries that already exists within government and nongovernment organizations, and that is not made available to the public. Furthermore, organizations exist in the Federal govern-

ment which have expertise in collecting and disseminating information, and which could be given greater responsibility with respect to international information.

It has been suggested that a clearinghouse for international resource information might best be created by a consortium of governments. As a first practical step, an existing entity should undertake this task: an international agency, an agency of the U.S. government, or a private sector organization could organize the international resource information currently available within the existing information network. This effort should entail not only input from many different government agencies, but also the collection and organization of international data from organizations such as the World Bank, the United Nations, and OECD, and from agencies of foreign governments and corporations.

Who specifically should bear the responsibility for this clearinghouse? If this task were to be assumed by a Federal agency, we feel that it should be assumed by an organization familiar with statistical activities, such as the Bureau of the Census which has experience in collecting and disseminating large volumes of information. We emphasize it could also be run either by a private sector organization or an international agency.

Information contained in the data base should be standardized, whenever possible, to make it comparable from one country to another. Although standardization may be a time-consuming and therefore expensive process, the resulting consistency would be crucial to the ultimate usefulness of the data base.

3. The Collection of More and Better Data Regarding Environmental Quality

a. Recommendation

The Federal government should collect more and better data regarding environmental quality.

- The Federal government should develop monitoring strategies to ensure that needed information is being collected, and should improve its monitoring practices and analytical procedures to better ensure data quality.

- Within each agency, there should be a high-level office responsible for coordinating monitoring policy and procedures among the program offices and for ensuring that the monitoring function receives high-priority attention in budget appropriations.

b. Discussion

Many corporations subject to environmental regulations complain that data on environmental quality is not adequate. The government is clearly responsible for ensuring that compliance with regulation is feasible. Corporations need better information to more efficiently (1) participate in the development of regulatory standards and (2) comply with regulatory requirements for permits and operations. The way to improve data on environmental quality is to expand upon and upgrade the monitoring, analytical, and data documentation procedures now conducted by government agencies.

More monitoring raises the issue of how best to allocate responsibility for actual monitoring, i.e., what are the proper private/public roles in this area? It would be unrealistic to hold government agencies responsible for all monitoring -- at every site, for instance, at which a company might want to locate a new plant. Some monitoring must be left to corporations. However, it is fair to say that government agencies could do a better job of

monitoring, or of establishing standards for monitoring, than they are currently doing. Data regarding environmental quality trends could at least be provided on a city-by-city basis.

Our recommendation encompasses four basic objectives that would ensure improvement in the Federal government's approach to environmental quality data:

1. Development of monitoring strategies to identify existing and future environmental problems through national and local baseline and trend measurements. These strategies should be designed to provide the basis for setting sound regulatory standards and for determining compliance.

2. Insistence upon agency monitoring that is technically and scientifically sound. The data gathered should be quality assured at all phases of the monitoring and analytical processes.

3. Greater accessibility of environmental data to the public. EPA regional and program offices must make regular, accurate reports to the information clearinghouse at the EPA.

4. Coordination of the planning and execution of monitoring activities within each agency. The proper functioning of any monitoring system is best assured if one group within an agency is responsible for coordinating monitoring policy and procedures in the program offices. This same entity should be responsible for reviewing agency budgets to make sure that adequate resources are devoted to the collection, analysis, and management of environmental quality data.

This last objective is designed to remedy the current "orphan" status of monitoring with respect to the budgeting process; monitoring programs are often the last to be considered for funds, and at times lose out entirely. If monitoring is to be improved, more funds must be allocated to the monitoring process on a regular basis. Hence, the need for an oversight body in each agency to ensure that proper budgetary decisions are made.

The attainment of these objectives would constitute a major improvement in the status of environmental quality data.

4. An Improvement in the Credibility of Government Natural Resource Forecasts

a. Recommendation

The government should improve the credibility of its forecasting in the area of natural resources.

- More private-sector expertise should be incorporated in natural resource forecasts.
- Documentation of all data assumptions and methodologies should accompany forecasts.

b. Discussion

On the basis of our interviews, U.S. corporations are clearly discontented with government forecasting in the area of natural resources; corporations request more collaboration between government and industry. Mechanisms are needed for increasing the input to government forecasts by experts outside the government. Corporate executives also want better documentation of what's behind the government's forecasting. While there are several means of achieving these goals, our recommendation focuses on two actions that could result in immediate improvement.

The first is that government invite more experts from the private sector and academia to participate in its forecasting processes. Often analysts in corporations or research institutions have had an opportunity to focus on a particular industry or resource which gives them an expertise that may not be easy to acquire elsewhere. Conversely, government analysts are often not as familiar with ongoing private sector developments as their corporate or academic counterparts, and they may not be able to incorporate the most

up-to-date industry and market factors into their forecasting. In sum, the transfer of knowledge from the private sector could greatly improve government forecasts.

The second recommended action is that documentation of assumptions and methodologies should accompany all government forecasts. One corporate information user vehemently complained that the government's forecasting system "is like a huge black box." At best, we concluded that some but not all government forecasters provide information regarding their analytical procedures. Corporate users want to know the data base, the assumptions, and the methods on which the analyses are based. Forecasts would be of greater value if the forecasts were documented in sufficient detail that corporate users could modify the forecasts, if they so wished, based on the corporations' own data or assumptions.

5. An Improvement in the Timeliness of Government Resource Information

a. Recommendation

The government should make its resource information more timely by releasing it in electronic form as soon as it is ready for publication.

- As soon as resource information has been prepared for publication, it should be released to the general public and to private information companies which could make the information available electronically.

b. Discussion

Almost all corporate participants criticized the timeliness of government information. A key question is whether the government should disseminate information in a more timely fashion to the public as a whole, or whether this service would best be performed by a middleman? What method of delivery would be the fastest?

One of the primary reasons that government information is not timely is the significant delay that results from the process of publication. In some instances, this process can take as long as six months, producing a significant lag in information availability. Information in pre-publication electronic form, such as photo-composition tapes, offers a technological solution.

One approach would be to make information tapes available to the general public, at a nominal cost, at the same time the data is sent to be printed. Private information companies could then make the information available electronically. Thus, an individual user could readily obtain the information either directly from the government, or indirectly from information companies. This combination of early release and electronic transfer would vastly improve the timeliness of government data.

B. A Strengthening of Federal Statistical Policy Management

a. Recommendations

The government should strengthen the ongoing management of Federal statistical policy and programs.

- A senior policy official within the Executive Office of the President (e.g., an Assistant Director of the Office of Management and Budget for Statistical Policy) should lead an interagency working group on U.S. statistical policy management for the purpose of reviewing existing policy and recommending action for current and future information needs.
- Statistical policy management should be assigned to an individual in each agency which is responsible for the collection and publication of information.
- The management of statistical policy should be given high priority in the agencies.

b. Discussion

It is clear from our study that the existing policies of the government provide a mandate for making resource information available. It is also clear that the government is not adequately fulfilling this mandate. One way to strengthen the management of government statistical policy and to meet future national needs for resource information is to coordinate agency efforts at a sufficiently high level.

Because good information is so critical to sound decision-making, in both the public and private sector, we believe the responsibility for statistical policy development and the coordination of information systems should be housed within the Executive Office of the President.

The current system of data collection and dissemination is, to a large degree, decentralized. Given this fact, a high-priority task should be to evaluate the information system as a whole. In a rapidly changing environment, there is a particular need for continual review of the relevance of the information being collected and published. This review can and should be done within each individual agency; but to cross-check the efforts of many agencies, a coordinated review is also necessary. Only a coordinated effort can satisfy corporate information users' desires for information that is consistent or standardized from one agency to another.

A senior policy official should be responsible for coordinating an Interagency Working Group to review the statistical policies of the agencies. The working group should serve as a forum for discussion and analysis of U.S. statistical policy as a whole. The policies of the agencies should be examined with regard to the needs of the general public as well as corporate users. The designated official should consult with the working group concerning potential changes in policy.

We do not recommend that control over the specific actions of the agencies (e.g., collection, dissemination, and analysis of information) be centralized. We recommend that the implementation of statistical policies developed both by the agencies and by the Interagency Working Group be carried out in the agencies. Individual agency representatives will be aware of the structure and current policies of their agency and should be in the best position to carry out policies.

C. Corporate Evaluation of Recommendations

The 197 corporate participants were given an opportunity to evaluate each of the six recommendations of this report as they appeared in draft form. We received 114 corporate replies -- a response rate of 58%. Most of the respondents evaluated all six recommendations. Because some respondents evaluated less than six, there were 660 evaluations in total.

Overall, 96% of the evaluations agreed with the recommendations; 24% of these agreed with the recommendations but with some qualifications. Only 4% of the evaluations disagreed with the recommendations. We have summarized the corporate evaluation of each recommendation in Exhibit 5 below.

EXHIBIT 5

CORPORATE EVALUATION OF RECOMMENDATIONS

RECOMMENDATION	AGREE	AGREE WITH QUALIFICATIONS	DISAGREE
1. INDEX OF GOVERNMENT RESOURCE INFORMATION	87%	13%	00%
2. CLEARINGHOUSE FOR INTERNATIONAL NATURAL RESOURCE INFORMATION	69%	27%	04%
3. COLLECTION OF MORE AND BETTER DATA REGARDING ENVIRONMENTAL QUALITY	58%	36%	06%
4. AN IMPROVEMENT IN THE CREDIBILITY OF GOVERNMENT NATURAL RESOURCE FORECASTS	57%	33%	10%
5. AN IMPROVEMENT IN THE TIMELINESS OF GOVERNMENT RESOURCE INFORMATION	88%	12%	00%
6. A STRENGTHENING OF FEDERAL STATISTICAL POLICY MANAGEMENT	69%	24%	07%
RECOMMENDATIONS OVERALL	72%	24%	04%

According to these figures, the highest percentage of agreement was with the recommendations to improve the timeliness of government resource information and to create an index of government resource information. These were also the only two recommendations with which no respondents disagreed.

The next highest level of agreement came with the recommendations to strengthen Federal statistical policy management, and to establish a clearinghouse for international natural resource information.

The highest rate of disagreement was with the recommendation to improve the credibility of government forecasts; those who disagreed with this recommendation did so because they felt that the government lacked the expertise necessary to produce viable forecasts. These people felt that the government should get out of forecasting altogether, and should leave it to the private sector.

The recommendation with the highest rate of qualified agreement was that of collecting more and better data regarding environmental quality. Mostly, these qualifications stemmed from a concern that we were recommending that the Federal government assume complete responsibility for data collection in this area, excluding contributions from the private sector. Many respondents see a role for the private sector in the collection of environmental quality data, particularly on a site-specific basis, and are concerned that (a) the Federal government does not consider their data credible, and (b) the assumption of full responsibility by the Federal government would be overly expensive and inefficient.

One of the major concerns expressed by the respondents with respect to the recommendations as a whole had to do with cost. The respondents stressed that implementation of recommendations be cost-effective and that they be accomplished within current budgets. Respondents also stressed that the recommendations should be funded by discontinuing ineffective statistical programs which already exist.

The second overall concern, and one expressed quite vehemently by the respondents, was that the private sector and not the Federal government, should be given responsibility for implementing many of these recommendations. In particular, this opinion was expressed in relation to creating and maintaining an index of government natural resource information, creating a clearinghouse for international resource data, and improving forecasting. As part of the reasoning behind this reaction, respondents stated that the implementation of these recommendations would be extremely costly, and that private sector companies might be able to handle the task more efficiently than the Federal government.

APPENDICES

APPENDIX 1

ELECTRONIC ACCESS

Advances in computer and telecommunications technologies have dramatically changed the ways in which users can receive and manipulate information. Electronic delivery of information is increasingly gaining acceptance in corporations throughout the U.S. and abroad. As is the case with any new technology, some people are quick to employ these new tools and others are less comfortable with change, preferring to use techniques with which they are familiar. This situation explains, in part, the truly mixed response we received when survey respondents were asked to evaluate the importance of being able to access information electronically.

To investigate the issue of electronic access of information, we worked from the hypothesis that information users as a group consider it to be very important. After our investigation, both in a written survey and in personal interviews, we could not prove that hypothesis.

In the final written survey, 62 people evaluated the importance of computer accessibility, along with the importance of 16 other attributes (see Appendix 2). Computer accessibility ranked as the least important of all 17 attributes, with 6% of the respondents rating the attribute "extremely important", 16% rating it "very important", 13% rating it "important", 39% rating it "moderately important", and 26% rating it "of no importance". It is interesting to note that even though computer accessibility was the least important attribute, only 26% of the survey respondents felt it had "no importance".

In addition to indicating the importance of computer accessibility as an attribute, survey respondents had the opportunity to express the extent to which they thought computer accessibility would make each specific report they evaluated more useful. The 282 responses averaged very near "neutral opinion"; the responses to this question were the most evenly distributed of all, indicating no strong sentiment that computer accessibility would help or hinder.

The mixed reaction found in the survey surfaced in the interviews. Some people stressed the importance of computer accessibility; some expressed uncertainty. Some thought it would hurt, not help. Some made the point that it would be beneficial for certain reports and not others. Some of the companies have the capability of receiving, storing, and manipulating information electronically; some of the very large corporations in the study, despite what one might assume, have no such capability. "We're a bit in the Dark Ages that way," observed one analyst.

Perceptions of the value of electronic accessibility varied in part because it can encompass any or all of the following attributes:

- timeliness, in that data transmitted on-line can reach the user rapidly and make data more timely;
- convenience of access, in that a user can obtain information through a terminal on his desk;
- ease of locating information, in that computerized information is usually indexed and locatable by computer-aided search;

- data manipulatibility, in that data already electronically encoded may be manipulated by analytical programs, including some with the ability to display information graphically;

- data base management -- the maintenance of accurate, consistent data in a format ready for use -- or other services rendered by providers of electronic information.

Electronic accessibility, whether by tape, disk, cassette or on-line, embodying some or all of the above qualities, would seem to be a redeeming feature as many corporate participants reported it to be. But it also might not be useful, as suggested by the following:

- some companies are not yet oriented toward using data on a computer;

- many companies have problems reading tapes;

- data is not in a format useful for analysis and must be reformated;

- some data bases are very expensive and a user must subscribe to an entire data base when needing only a single series of numbers; indeed, Shearson/American Express has concluded that it can develop its own data base for its commodities analysis at a lower cost than using an outside service;

- greater speed is not always desirable; a securities analyst at Salomon Brothers worried that data transmitted electronically might bypass the existing informal verification process and cause the markets to react to information whether or not it were verified.

Electronic accessibility means different things to different people; depending upon what needs a user perceives electronic accessibility to satisfy, its value varies. Human reaction here mirrors that in other areas of advancing computer technology: while some people are at the cutting edge of user technology, some will insist to their dying day on a printed report sent through the mail.

APPENDIX 2

THE NEEDS FOR AND SOURCES OF RESOURCES INFORMATION IN LARGE U.S.-BASED CORPORATIONS

Survey Questionnaire
December, 1983

NOTE: For the purposes of this report, pages 8-15 of this questionnaire have been omitted because they are identical to pages 6 and 7.

THE YEAR 2000 COMMITTEE
1601 CONNECTICUT AVENUE, N.W.
SUITE 200
WASHINGTON, DC 20009
(202) 328-8425

To the Resource Information User:

As part of its ongoing effort to make its information services more responsive to private sector needs, the Federal government has commissioned a study to investigate:

- the importance of worldwide natural resource information in corporate decision-making;
- the information about such resources the private sector seeks;
- the role and effectiveness of the Federal government in meeting corporate needs for information;
- the roles of private providers of resource information; and
- the factors which affect the usefulness of resource reports.

The Year 2000 Committee staff is conducting this survey in conjunction with the project described above. The survey is designed to evaluate the attributes of various sources of resource information used by people in the private sector. The results will be presented to President Reagan's Cabinet Council on Natural Resources and Environment in May, 1984. For your information, a description of the Year 2000 Committee and an executive summary of the study are included in an appendix.

You have been selected to participate in this survey because your job entails using resources information on a regular basis. The number of people participating in the survey is small, so your answers are very important to us.

We ask that you take a few minutes to fill out this questionnaire and encourage you to respond frankly. Please return the completed questionnaire to the person who distributed it to you.

This is the final version of the survey. We have designed it based upon dozens of in-person interviews and a "pre-test survey" of 38 people. As a result, we are certain that your answers will be very meaningful to us.

If you have any questions, please do not hesitate to contact the survey staff: Tod Heisler and Kelly Teevan at (202) 328-8425.

We greatly appreciate your cooperation.

RESOURCE TOPICS

The following list indicates the resource topics we are studying. Please put a check next to the resource topics about which you use information. Please limit your responses to topics that you feel are relatively important to your area of responsibility.

Please note: we are investigating information pertaining to unprocessed resources (petroleum, wheat, trees) and not downstream products (electricity, bread, houses).

	Keypunch Column		
Natural Resources	[28]	_____	fuel minerals
	[29]	_____	non-fuel minerals
	[30]	_____	water resources
	[31]	_____	land resources
	[32]	_____	forests
	[33]	_____	species
	[34]	_____	renewable energy resources
Unprocessed Food Resources	[35]	_____	livestock
	[36]	_____	crops
	[37]	_____	fish
Environmental Quality	[38]	_____	climate
	[39]	_____	atmosphere & air quality
	[40]	_____	water quality
	[41]	_____	land quality
Population	[42]	_____	demographics

FOCUS OF THE STUDY

We will be asking you to evaluate certain sources of resource information. It is very important that you understand the way we define "resource information" so that your responses will apply to our area of study. Listed below are the resource areas we are studying and the kinds of information upon which we are focusing. Please note that in all cases we are referring to numerical information.

RESOURCE TOPICS	TYPES OF INFORMATION
Natural Resources	Supply (reserves, production, stocks, geology where relevant) Demand (consumption, use) Price Trade figures
Unprocessed Food Resources	Supply (populations, acreage, yields, production, stocks) Demand (consumption, use) Price Trade figures
Environmental Quality	In this area, only numerical information describing the status, quality, or inventory of the resources is pertinent. Other information (regulations, compliance data, costs) are not covered by this study.
Population	Indicators of size, growth, fertility, mortality, migration, geographical distribution, density, and characteristics (age, sex, race) are relevant. Economic, labor and social indicators such as income, job type, health and education are excluded from this study.

EXAMPLES TO AID IN DETERMINING PERTINENCE OF REPORTS

On the next page we will ask you to select resource reports for evaluation. To insure that the reports you choose pertain to our study, a definition of "reports" and "sources" is necessary. For purposes of simplification, we are using "report" to describe all kinds of information even if they are not hard-copy sources of information, such as computer tape or an on-line information service. Also, we are interested in resource information from all sources including Federal, state and local governments; trade associations; consulting companies; trade journals; newsletters; in-house sources; and others.

The following are examples of reports which are pertinent, not pertinent, or conditionally pertinent to the study:

Oil and Gas Journal
Sparks Commodity Reports
California Air Quality Data
1980 Census
DRI - Energy Data Base

DRI - Economics Data Only
Federal Register
Monthly Labor Review
Design of Small Dams
Annual Housing Survey

Los Angeles Times
Wall Street Journal
Newsweek
Science
Dialog

PERTINENT

Contain quantitative data directly describing the basic resources.

NOT PERTINENT

Contain no quantitative data, or contain data which do not describe the basic resources as we defined them.

CONDITIONALLY PERTINENT

Pertinent if you obtain from them numerical data about the basic resources and you use those data in your work.

REPORT SELECTION AND RANKING

This survey focuses on identifying and evaluating the attributes of resource information that you use frequently. At this time, we would like you to select the ten reports that are most important to your job. Below please list, in any order, the ten resource reports most important to you. If you use fewer than ten, list them all. Also indicate the organization producing the report.

Once you have listed the reports, we would like you to rank the five reports that are most important to your job. In the column to the right of the reports list, please put a "1" next to the most important report, a "2" next to the second-most important report, and so on until you have ranked the five reports that are most important to you. Please do not rank more than five reports.

	Complete "Report" Name	Source Organization	Importance Ranking (Rank 5 only)
1.	_____	_____	____
2.	_____	_____	____
3.	_____	_____	____
4.	_____	_____	____
5.	_____	_____	____
6.	_____	_____	____
7.	_____	_____	____
8.	_____	_____	____
9.	_____	_____	____
10.	_____	_____	____
	[6 - 50]	[51 - 80]	[5]

RATING REPORTS ON ATTRIBUTE DIMENSIONS

On the following pages you will find rating sheets for your five most important reports. At the top of each page, starting with the most important report, and ending with the fifth most important report, please write the title of each report in the space provided.

On each sheet you will find a set of statements. Please consider each statement and place an "X" in the space that most accurately indicates your level of agreement or disagreement with the statement as it applies to the report you are rating. If the report being evaluated is the most recent issue of a periodical or series, please express your opinion about the series of reports rather than the current issue in isolation.

Please consider the following example:

Suppose you work for an oil company and your job entails tracking the supply, demand and price of petroleum. One of the reports you have selected as significant to performing your job is a Department of Energy report, Petroleum Supply Monthly. You are asked to consider the following statement about the Petroleum Supply Monthly.

	strongly agree	agree	neutral opinion	disagree	strongly disagree	not applicable	don't know
This report is reliable.	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]

If you think the Petroleum Supply Monthly is reliable, put an "X" in the box under agree or strongly agree, depending on how reliable you feel it is. If you feel the report is unreliable, put an "X" under disagree or strongly disagree. If you neither agree nor disagree, place an "X" under neutral opinion. If the statement does not apply to Petroleum Supply Monthly, put an "X" under not applicable. And if you have insufficient knowledge concerning the statement, put an "X" under don't know. In this example, the respondent agrees that Petroleum Supply Monthly is a reliable report. There are no right or wrong answers! It is your opinion that is important to us.

RATING OF _____ ON ATTRIBUTE DIMENSIONS
(please write in report name)

1.	The data in this report are accurate.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [35]
2.	The data in this report would be more useful to me were they computer accessible.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [36]
3.	The format and layout of this report make it easy to read.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [37]
4.	The analyses which accompany the data in this report are useful.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [38]
5.	The data in this report are not collected and published frequently enough.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [39]
6.	The text clearly describes the methods used to assemble the data presented.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [40]
7.	The time periods covered by this report suit my needs.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [41]
8.	The sources used to compile the data in this report are documented clearly.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [42]
9.	This report predominantly contains data far removed from the source.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [43]
10.	The report clearly explains revisions in the data whenever they are made.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [44]
11.	The data are reported in sufficient detail.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [45]
12.	The assumptions used in the analyses are outlined clearly.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [46]
13.	By the time I receive this report, the data are too old to be pertinent.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [47]
14.	This report is comprehensive in its coverage of the subject matter.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [48]
15.	This report is unbiased.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [49]
16.	I find I can easily reach someone associated with this report to answer my questions about it.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [50]
17.	The data are aggregated at levels which suit my needs.	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] [51]

OVERALL RATING, REPORT DESCRIPTION AND FREQUENCY OF USE

A. Consider the report that you feel is the best report you have ever used. On the scale below this "best report" would measure a "10". Now compare the report you evaluated on the previous page to this best ("10") report; circle the number below that describes your level of overall satisfaction with the report evaluated on the previous page.

Dissatisfied				Neither satisfied nor dissatisfied		Satisfied				
Very much		Somewhat				Somewhat		Very much		
1	2	3	4	5	6	7	8	9	10	[52,53]

B. We would like you to describe some of this report's features. For each of the three categories listed below, please check the characteristic(s) which best describes the report you have just evaluated.

1) Source of report: [54-61]

_____ Federal government
_____ State/local government
_____ Private consultant
_____ Publishing company
_____ Trade or professional association
_____ International organization (e.g., UN, IMF, OECD, IEA)
_____ Trade journal
_____ Other _____ (please specify)

2) Information provided: [62-65]

_____ Raw data
_____ Data analysis
_____ Projections/forecasts
_____ Other _____ (please specify)

3) Resource topics: [66-69]

_____ Energy resources
_____ Natural resources (other than energy)
_____ Unprocessed food resources
_____ Environmental quality
_____ Population

C. During the past year, how often have you used this report? [70]

_____ 1 to 11 times
_____ at least once per month
_____ 2 to 3 times per month
_____ weekly
_____ more frequently

ATTRIBUTE IMPORTANCE

HOW IMPORTANT IS IT TO HAVE A RESOURCES INFORMATION REPORT...

	extremely important	very important	important	moderately important	of no importance	not applicable
1. which is accurate?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
2. which is computer accessible?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
3. which is easy to read?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
4. in which useful analysis accompanies the data?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
5. which contains data collected and published with the proper frequency?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
6. in which the text clearly describes the methods used to assemble the data?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
7. which covers appropriate time periods?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
8. the sources of which are clearly documented?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
9. which predominantly contains data close to the original source?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
10. which clearly describes revisions in the data whenever they are made?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
11. which has sufficient detail?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
12. in which the assumptions used in the analysis are outlined clearly?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
13. which is timely?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
14. which is comprehensive?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
15. which is unbiased?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
16. which provides reference to a contact person to answer questions?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
17. in which the data are aggregated at a useful level?	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

[col]

GENERAL RESPONDENT INFORMATION

Please fill in the blanks below:

Your title _____ [18-40]

Your department _____ [41-59]

Title of person to whom you report _____ [60-78]

Please check "yes" or "no" for each statement below.

_____ YES _____ NO In general, I make the decision to acquire from sources outside the company the resource information I use. [79]

_____ YES _____ NO In general, the decision to acquire from outside the company the resource information I use is made by someone else in the company. [80]

In the space below we welcome any comments you would like to make.

APPENDIX 3

LIST OF PRODUCTS GENERATED BY THE STUDY

IN ADDITION TO THIS REPORT

1. Participant guide listing the names and titles of the 229 study participants.

2. A 500-page document detailing interviews conducted for this study.

3. A document containing the 124 evaluations of this study's recommendations.

4. Computer printouts including the factor and regression analyses of the survey responses.

5. The 877 report listings and publication sources submitted by corporate survey respondents as their 10 most important resouce reports.

6. List of the top five ranked reports categorized by rank, overall rating, type of source, and frequency of use.

7. List of environmental quality related reports cited by survey respondents.